REMARKS

Applicants have received and reviewed the Office Action dated July 7, 2009. Applicants request entry of this Amendment and reconsideration of the rejection of the claims.

By way of response, Claims 23, 35, and 42-43 have been amended. New claims 48-49 have been added. Applicants submit the amendments to the claims are supported throughout the specification including at page 19, lines 3 – 15 of the specification, as well as Figures 4 and 5.

35 U.S.C. § 101

Claims 23-34 were rejected under 35 U.S.C. § 101 as being directed to non-statutory subject matter. Applicants traverse this rejection.

Applicants claim 23 is directed to a method of heavy particle separation, comprising a primary separation stage, the primary separation stage comprising: dropping of particles onto a transversely operated belt that is moved in a direction transverse to the direction of movement of particulate material; accumulating a first group of particles having substantially medium to low density; concentrating a second group of particles having substantially medium to high density, concentrating comprising: providing a variable concave profile in the belt; and subjecting the first and second groups of particles to separation in the concave area, each in an opposite direction; and discharging each of the groups at an opposite end of the belt, wherein the first and second groups of particles are separated and discharged at exit points located at 180° relative to one another. (emphasis added)

Under section 101, patentable subject matter includes a new and useful process. As such claims 23-34 qualify as patentable subject matter as being directed to a process. The claims do not need to be tied to a different statutory class , or positively recite subject matter transformed unless the claims involve abstract ideas, natural phenomenon, or a law of nature. The present claims do not fall into this category. Moreover, the claims involve a machine (another statutory class), a "transversely operated belt". Applicants respectfully request withdrawal of this rejection.

35 U.S.C. § 112

Claims 42 and 43 were rejected under 35 U.S.C. § 112, second paragraph, as indefinite. While not acquiescing to the rejection and solely to expedite prosecution, the claims have been

amended to provide antecedent basis. Applicants respectfully request withdrawal of this rejection.

35 U.S.C. § 103(a)

Claims 23-35 and 37-46 were rejected under 35 U.S.C. § 103(a) over Blake (US 964,083) in view of Rohr et al., US 6,059,120 and Newman et al., US 4,962,858. Applicants respectfully traverse this rejection, in so far as the rejection finds application to the present claims, and in particular to the newly presented claims.

Scope and Content of the Prior Art

Blake teaches movement of an endless flexible belt at right angles to the longitudinal axis of the apparatus. Substantially parallel (obliquely disposed) grooves are a feature of the belt. Heavy particles are captured and retained in said grooves, while light particles are washed (or blown) over said grooves, ultimately into collection tray P and the unreferenced collection tray located between reference numerals E and D in Figure 1 of Blake. Heavy particles travel over the higher edge of the belt in the direction of motion of the belt (i.e. over the rollers situated near reference numeral D, depending on the direction of travel of the belt). Therefore, separation of heavy particles relative to light particles occurs at 90° relative to each other, irrespective of which light particle collection tray is a reference point. Also, particles are washed and concentrated in the center of the sag of the belt.

Newman's belt, throughout the detailed description and with due regard to the accompanying figures, teaches a belt having a straight profile. Accordingly, there is no teaching in Newman that would allow a person of ordinary skill to utilize a concave belt in a variably concave configuration. Figures 2 and 4 of Newman clearly show a straight arrangement of support or idler rollers 35. In addition, idler rollers 55 are present to control belt tension. Support rollers 35 and idler rollers 55, in combination, teaches away from having a concave belt profile, let alone a variably concave belt profile. It is clear that the Newman apparatus intended to have a belt that has a straight profile. Further, Figures 2 and 4 of Newman reveal that riffles 27, opening means 37 and metal rods 39 are required to be in close proximity to the belt. Metal bars 39 have the additional feature of maintaining the sluice box 19 intact (see col 5, lines 52 to 55). This implies that the metal bars 39 must remain static, otherwise the structural integrity of the sluice box 19 may be compromised. This interpretation of the Newman apparatus is in line with its teaching of a straight belt profile.

Rohr discloses a belt having baffle plates mounted on a conveyor belt. There is no teaching of providing a variable concave profile in the belt of Rohr. An important feature of the Rohr apparatus is the presence of a knocking or striking roller 13. This, taken together with support roller 9, suggests that the belt has to necessarily be taut in order to give effect to the striking roller 13. A substantially loose belt, as would feature in an apparatus having a variably concave belt profile, would render the effect of having a striking roller 13 useless. Having regard to Figure 9, it is clear that the eccentrics 36, which support the striking roller 13, are designed to be static. These design considerations are inconsistent with the idea of having a variable concave profile in a belt.

Differences Between the Claimed Subject Matter and the Prior Art

The present claimed subject matter provides the advantages of increased efficiency, recovery and profitability. It achieves these advantages through the following functions, viz. repetitive density assessment of particles, a more accurate scrubbing of these particles and an increased retention time of the particles. The present claims achieve these functions through the use of the following combination of features:

a variably adjustable concave belt, which defines particle movement and variable adjustable separation intensity;

a belt that moves in a direction transverse to particle movement and resultant 180° separation of heavy versus light particles; and

a continuous spiral formation located on the belt.

Heavy and light particles are separated at opposite ends of the belt by, firstly the introduction of particles into the (concave) concentration area. These particles are then fluidized and a slurry is created. Heavy particles in the slurry settle to the surface of the belt and are urged upward towards the upper end of the belt (or upper belt flight) by virtue of the continuous spiral formation located on the belt and in a direction transverse to belt travel. Light particles in the said slurry float and by virtue of gravity are washed towards the lower end of the belt (or the lower belt flight). Heavy particles are then removed from the concentration area after it passes over the edge of the belt located at the upper belt flight. Medium to low density particles having been washed down from the upper belt flight to the lower belt flight are assessed again by virtue of the movement of the belt.

The cited references alone or in combination do not disclose all of the elements of the claims. A significant difference between Blake and the present claims is simply that these two apparati function completely differently from one another. Heavy particle separation by Blake occurs in the direction of movement of the belt, which is in the same direction of movement of the riffle formations. Light particles are washed over the side of the belt. Therefore separation of light particles relative to heavy particles occurs at exit points located 90° relative to each other. The angle of tilt of the Blake belt does not allow for extended retention times of particles as these particles simply wash over the side of the belt. Therefore, the apparatus of Blake does not provide a more accurate and repetitive scrubbing of particles. In addition, Blake does not teach a transversely operated belt as defined and taught by the present claims.

The present claims, on the other hand, teach particles that are moved transversely to the movement of the belt, i.e. in the same direction as the movement of the spiral formation. When fluidized through the creation of a slurry (see below) heavy particles and light particles separate at opposite ends of the belt (i.e. at exit points located 180° relative to each other). In addition, the concave profile of the present claims provides increased retention times for a more accurate and repetitive scrubbing. A detailed analysis of the combination of features that function in concert to achieve this is presented herebelow.

Repetitive density assessment of particles, a more accurate scrubbing of these particles and an increased retention time of the particles is achieved by virtue of particle movement in three directions: the first direction being in line with the direction of belt movement, the second by virtue of movement of the continuous spiral towards the upper belt flight, and the third by virtue of the fluid (or water) moving towards the lower belt flight. The combination of the aforementioned movements of particles results in a rolling, corkscrew-like movement (spiral), which is repeated as the heavy, medium and light particles travel towards the upper and lower belt flights, as the case may be (see page 9, pars 4 and 5 of the detailed description of the invention). This allows for a constant re-evaluation and density assessment of the particles that are undergoing separation, as well as an increased retention period. Medium density particles are repetitively assessed by virtue of the above-mentioned rolling movement. This leads to an unexpected higher recovery of relatively heavy particles, through most notably, the synergistic combination of the features described.

The intensity of separation can be controlled using the concave profile of the belt. Figure 4 of the specification shows a symmetrical cross-sectional profile of the belt, while Figure 5 shows an asymmetrical cross-sectional belt profile. Figure 5 illustrates the utility of having a variable (and where appropriate asymmetrical) cross-sectional belt profile. In fact, the additional adjustment of the rightmost idler roller in Figure 5 creates an asymmetrical cross-sectional belt profile within an existing asymmetrical cross-sectional belt profile. In other words, by moving the axis of symmetry from the center of the cross-sectional width of the belt in Figure 4, to the center of the concave depression in Figure 5, the cross-sectional depression itself can be subject of an asymmetrical belt profile. Whereas Figure 4 would illustrate positional symmetry (or asymmetry as the case may be) of the belt generally, Figure 5 would illustrate to shape symmetry of the concavity on a particular position on the belt. Using this feature, the intensity of the rolling, corkscrew-like movement of particles as aforesaid, can be controlled.

In the context of heavy particle separation, the particles (both heavy, medium and light) are fluidized as aforementioned in order to create a pulp/slurry. This slurry undergoes scrubbing and density re-assessment in order to liberate minerals and to thereby facilitate separation of heavy particles from light particles (see specification page 8, lines 5 to 7). The concave profile of the belt provides for a greater retention of particles subject of separation, and the rolling or corkscrew-like movement of the particles as occurs in the present claimed invention allows for a more accurate and aggressive scrubbing and density reassessment of particles. The ability to control the degree of aggressiveness and scrubbing is provided by the variable and adjustable nature of the concave belt profile. It must be borne in mind that the concave profile of the belt is variable, meaning that the concave profile of the belt is fully adjustable. This allows an infinite number of horizontal and vertical settings, which in turn provide an infinite number of concave belt profiles.

This feature, together with features of the belt speed (which is variable), pitch of the spiral formation located on the belt, and the angle of inclination of the apparatus (and in turn the belt) function in concert to achieve the correct density of slurry which is an important step in ultimately achieving enhanced separation. The enhanced degree of separation as described above cannot be achieved in the absence of having a fully adjustable variable concave profile in a belt as taught by the present claimed invention. The separation technique of the present claims

as aforementioned therefore stands separate and distinct from the separation techniques taught in each of the listed prior art references.

The present apparatus teaches, *inter alia*, a spiral formation, preferably in the form of a rib, wherein the spiral formation is in the form of a continuous spiral. The Blake reference, in contrast, expressly discloses employing a belt with a series of parallel or substantially parallel grooves running obliquely to the direction of travel of the belt (Blake par 43 – 46). An apparatus including such series of grooves does not teach or suggest the continuous spiral formation of the as claimed.

None of the prior art references, and in particular Blake, teach or suggest the corkscrew-like movement that the present claimed invention teaches, or the variably adjustable intensity of separation achievable by the claimed invention. In fact, none of the prior art documents teach or suggest the operation of a variably concave belt profile which functions to achieve the aforesaid movement and variable intensity of separation. In addition, Blake et al does not teach or suggest separation of the particles at exit points located 180° from one another. Thus, the cited references do not teach all of the elements of the claims.

A considered interpretation of Newman and Rohr demonstrates a teaching away from the feature of having a variably concave belt profile in that the rigidity of the Newman and Rohr apparati would not function with such a feature in their devices. Therefore, there is no suggestion or reason to combine the teachings and suggestions of Blake, Newman and Rohr, as advanced by the examiner, to provide a variable concave profile in a belt, except from using the applicants' invention as a template through a hindsight reconstruction of the applicants' claims (see *Ex Parte Crawford et al, Appeal 20062429, decided May 30, 2007*). Applicants respectfully contend that even if the teachings of the prior art references were combined, a person of ordinary skill would not have devised the present claimed subject matter. The claimed subject matter, therefore, would not have been obvious to a person of ordinary skill. Withdrawal of the examiner's objections in this regard is respectfully sought.

Applicants now turn to deal with the examiner's reliance on a common sense benefit argument in so far as it applies to having a variable concave belt profile. Applicants caution the examiner to be aware of the distortion caused by hindsight bias (see KSR International Co. v Teleflex Inc. 127 S. Crt. 1727, 82 USPQ2d at 1397). Additionally, rejections based on obviousness grounds cannot be sustained by mere conclusory statements; instead there must be

some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness (as stated in *KSR Int'l. Co. v. Teleflex Inc., 127 S. Ct. 1727, 1741(2007),* quoting In re Kahn, 441 F.3d 977, 988 (Fed. Cir. 2006). The examiner, with respect, does not provide any source of information in any one the prior art references cited (whether in the field of the invention or otherwise) that sustains the argument of a common sense benefit (*Ex parte Koizumi et al Board of Patent Appeals Decision dated 8 April 2009*). While the examiner suggests that design incentives and/or economic considerations should have suggested the feature of the claimed invention relating to a variable concave belt profile, the examiner fails to support such a conclusory statement with specific reasons that would motivate the skilled addressee to apply this particular change to the base reference. See *Takeda v Alphapharm, 492 F.3d 1350 (Fed. Cir. 2007).* The examiner has provided no evidence of, from a prior art perspective (whether in the field of the invention or otherwise), the existence of an apparatus featuring a belt having a variably adjustable concave profile. Accordingly, the argument that the aforementioned feature was a well-known element that existed in the prior art must fail.

The above notwithstanding, KSR states further, that when work is available in one field of endeavor, design incentives or other market forces can prompt variations of it, either in the same field or a different one. For the same reason, if a technique has been used to improve similar devices in the same way, using the technique is obvious unless its actual application is beyond his or her skill [emphasis added]. Often it would be necessary to look at interrelated teachings of multiple patents the effects of demands known to the design community or present in the marketplace; and the background knowledge possessed by a person having ordinary skill in the art, all in order to determine whether there was an apparent reason to combine the known elements in the fashion claimed by the present claimed subject matter. Firstly, the prior art is silent on the feature of a variable concave belt profile. Secondly, the examiner has not presented any reference that demonstrates the existence of this feature in any other apparatus. The corkscrew movement of particles achieved by the combination of elements as described above, and in particular, the feature of providing a variable concave belt profile which allows variable separation intensities, goes beyond the ordinary person's skill.

A patent composed of several elements is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art (*KSR*). First, at least one of the elements of the claims has not been shown in the cited references. This notwithstanding,

even if the prior art references were combined, there would not have been any reason to introduce the feature of a variable concave belt profile. The absence of this feature from the prior art references is stark. In fact, the feature of a variably concave belt profile was certainly not obvious to try and in the context of the present claimed subject matter, takes the utility of a variable concave belt profile to beyond its primary purpose. The advantages posed by the present invention are not expected in that the combination leads to an unexpected and synergistic separation of particles subject to the separation. The examiner's argument in respect of ordinary common sense in light of the cited prior art documents must accordingly, and respectfully, fail.

In light of the aforementioned, Applicants respectfully submit that the invention as described and claimed is nonobvious, and therefore requests that the rejection be withdrawn.

Summary

In view of the above amendments and remarks, Applicant respectfully requests a Notice of Allowance. If the Examiner believes a telephone conference would advance the prosecution of this application, the Examiner is invited to telephone the undersigned at the below-listed telephone number.

Please charge any additional fees or credit any overpayment to Deposit Account No. 13-2725.

Respectfully submitted,
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